



Machine translation EP0416430

The invention concerns thermoplastic molding materials, containing A) 5 to 95.9 thread % of a thermoplastic PP (component A), B) 4 to 80 thread % of a component on basis of a Polyphenylenethers, which up to 40 thread % vinylaromatischen polymers in mixture can contain (Komponente B), C) 0.1 to 15 thread % the thermal tropics, liquidcrystalline Oligomeren or polymers (component C), D) 0 to 25 thread % india rubber reading tables of a polymer (component D) and E) 0 to 20 Gew,% further polymers (component E). Further the invention concerns the use of these molding materials for the production of molded articles as well as the molded articles, which are available as substantial components using these molding materials. Thermoplastic molding materials on the basis of Polyphenylenethern and Polyamiden are described e.g. in the EP-A 24,120, EP-A 46,040, EP-A 244,090, EP-A 262,901 and WO-A 87-00540. Due to the well-known incompatibility of Polyphenylenethern and PP partially low-molecular or high-molecular adhesion mediators are added. In accordance with the EP-A 226,910 Polyphenylenether also carboxylierte can be used. The additive from liquidcrystalline polymers to other polymers is well-known. So 32 16 413 mixtures from the thermal tropics, liquidcrystalline polymers and PP are described in the DE-OS, from which one receives molded articles with particularly high rigidity and firmness. In the EP 30,417 mixtures from liquidcrystalline polymers and other polymers e.g. PP or Polyphenylenethern are described. From the general teachings and the examples is to be taken that the additive liquidcrystalline polymers improves the workability (fluidity), however exhibits PP 66, which contains 10 thread % fluessigkristallinen polymers, a clearly reduced tenacity. The available invention was the basis the task to make thermoplastische molding materials available which have apart from a better workability additionally improved mechanical characteristics. The initially defined molding materials were found accordingly. Preferential masses of this kind and its use are to be inferred from the unteranspruechen. The PP contained as component A in the masses actually are admit and cover the part-crystalline and amorphous resins with Molekulargewichten (weight average values) of at least 5000, which is usually called nylon. Such PP are e.g. in the U.S. patent specifications 2,071,250, 2,071,251, 2,130,523, 2,130,948, 2,241,322, 2,312,966, 2,512,606 and 3,393,210 described. The PP can e.g. by condensation of aequimolarer quantities of a satisfied aliphatic C4-C12-Dicarbonsaeure or an aromatic C8-C12-Dicarbonsaeure with a satisfied or aromatic diamine, which exhibits to 14 carbon atoms, or by condensation by?-aminocarbonic acids or polyaddition by lactams are manufactured. The relationship from Amino to carboxyl final's groups amounts to 0,25:1 to 4:1. Preferential PP are Polyhexamethylenadipinsaeureamid (nylon 66), Polyhexamethylenazelaensaeureamid (nylon 69), Polyhexamethylenesebacinsaeureamid (nylon 610), Polyhexamethylenedodecandisaeureamid (nylon 612), those by ring opening of lactams of received PP such as Polycaprolactam, Polylaurinsaeurelactam, furthermore Poly-11-aminoundecansaeure and a PP from Di(p aminocyclohexyl) methane and Dodecandisaeure. It is also possible to

use in accordance with the invention of PP which were manufactured by copolycondensation by two or more above-mentioned polymers or their components, e.g. copolymers from Adipinsaeure, Isophthalsaeure or Terephthalsaeure and hexadecimal hexadecimaldiaminehexadecimal diamine or copolymers from Caprolactam, Terephthalsaeure and hexadecimal hexadecimaldiaminehexadecimal diamine. Linear PP with a melting point over 200°C are preferred. Particularly preferential PP are Polyhexamethylenadipinsaeureamid, Polyhexamethylensebacinsaeureamid and Polycaprolactam as well as PP 6/6T and PP 66/6T. The PP exhibit generally a relative viscosity from 2,0 to 5, certainly at a 1 gew.%igen solution in 96 of %iger sulfuric acid with 23°C, which corresponds to a molecular weight of approximately 15,000 to 45,000. PP with a relative viscosity from 2,5 to 3,5, in particular 2,6 to 3,4 are preferentially used. In addition PP are mentioned, which are available e.g. by condensation of 1,4-Diaminobutan with adipic acid under increased temperature (Polyamid-4,6). Manufacturing processes for PP of this structure are e.g. into the EP-A 38,094, EP-A 38,582 and EP-A 39,524 described. The portion of the PP A at the molding materials according to invention amounts to 5 to 95,9, preferably 15 to 94,9 and in particular 25 to 89 Gew.%. As component B the molding materials according to invention 4 to 80 contain, bevorzugt 4 to 60 and in particular 6 to 55 thread % of a Polyphenylenethers. Unmodified Polyphenylenether B1 or modified Polyphenylenether B2 as well as mixtures from B1 and B2 can be used. Modified Polyphenylenether B2 and mixtures from B1 and B2, which contain 55 to 95 thread % of a modified Polyphenylenethers B2, is preferential. The Polyphenylenether exhibits generally a molecular weight (weight average value) within the range of 10,000 to 80,000, preferably from 20,000 to 60,000. This corresponds to a reduced, specific viscosity?red from 0,2 to 0,9 dl/g, preferably from 0,35 to 0,8, measured in a 1 thread %igen solution in chloroform with 25°C. The unmodified Polyphenylenether B1 actually is well-known and by oxidative clutch by Phenolen disubstituierten in o-position is preferably manufactured. As examples of substituents halogen atoms are such as chlorine or bromine and alkyl residues with 1 to 4 carbon atoms, which preferably exhibit no?-staendiges tertiary hydrogen atom, e.g. methyl -, ethyl -, to call Propyl or Butylreste. The alkyl residues can be substituted again by Halogenatome such as chlorine or bromine or by a hydroxyl group. Further examples of possible substituents are Alkoxyreste, vorzugsweise with up to 4 carbon atoms if necessary or by Halogenatome and/or alkyl groups substituted Phenylreste. Copolymers different phenols are likewise suitable e.g. copolymers of 2,6-Dimethylphenol and 2,3,6-Trimethylphenol. Of course also mixtures of different Polyphenylenether can be used. Preferably such Polyphenylenether is used, which is soluble in these polymers completely or as far as possible with vinylaromatischen polymers compatibly, i.e. (see A. Noshay, Block of copolymer, S. 8 to 10, Academic press, 1977 and O. Olabisi, Polymer-Polymer Miscibility, 1979, S. 117 to 189). Preferential Polyphenylenether is Poly(2,6-dilauryl-1,4-phenylen)ether, Poly(2,6-diphenyl-1,4-phenylen)ether, Poly(2,6-dimethoxy-1,4-phenylen)ether, Poly(2,6-diethoxy-1,4-phenylen)ether, Poly(2-ethyl-6-stearyloxy-1,4-phenylen)ether,

Poly(2,6-dichlor-1,4-phenylen)ether, Poly(2-methyl-6-phenylen-1,4-phenylen)ether, Poly(2,6-dibenzyl-1,4-phenylen)ether, Poly(2-ethoxy-1,4-phenylen)ether, Poly(2-chlor-1,4-phenylen)ether, Poly(2,5-dibrom-1,4-phenylen)ether. Particularly to be preferred Polyphenylenether assigned, with which the substituents are alkyl residues with 1 to 4 carbon atoms, like Poly(2,6-dimethyl-1,4-phenylen)ether, Poly(2,6-diethyl-1,4-phenylen)ether, Poly(2-methyl-6-ethyl-1,4-phenylen)ether, Poly(2-methyl-6-propyl-1,4-phenylen)ether, Poly(2,6-dipropyl-1,4-phenylen)ether and Poly(2-ethyl-6-propyl-1,4-phenylen)ether. Further grafting copolymers from Polyphenylenether and vinylaromatischen polymers are suitable such as styrene?-Methylstyrol, Vinyltoluol and chlorine styrene. The molding materials according to invention can contain additionally phase mediator (component H). The component H increases the compatibility between PP and Polyphenylenether and favourably in quantities from 0,05 to 30 Gew,%, related to the sum of the components B1, B2 and H, is used, in particular on use of an unmodified Polyphenylenethers B1 in the molding materials according to invention. By a phase mediator H a substance is understood, which facilitates a mixing of two not compatible polymers and which adhesion between the phases in such systems improves (s. e.g. O. Olabisi, Polymer-Polymer Miscibility, Acad. Press 1979, cape. 1). In practice this means that the tendency is reduced to the Delaminierung in multi-phase polymer systems. Such phase mediators for A and B are actually well-known. Further can be used as phase mediator H 0.05 to 15 thread % related to the sum from A to D, serving polymers. As serving polymers come liquid polybutadiene, polyisoprene, Poly-1,3--pentadien or their copolymers with styrene?-Methylstyrol and p-Hydroxystyrol with a number means of the molecular weight of 150 to 10000 into consideration. As component H can be used 0.05 to 15 thread %, related to the sum of the components A to D, a epoxidhaltigen connection. Epoxy resins from epichlorohydrin and Polyhydroxyphenolen are suitable such as bisphenol A, hydrochinon or Resorcin as well as Glycidether modified phenol or Kresolnovolake, Phenoxyharze. Further epoxy resins from epichlorohydrin and Polyhydroxyalkoholen can being used such as ethyls -, propylene or Butylenglykol, polyethylene glycol, polypropylene glycol, Glycerin, Trimethylolethan and Pentaerythrit as well as Glycidether of Phenolen or aliphatischen alcohols, Glycidylderivate by amines e.g. the Diglycidylderivat by aniline. In addition epoxidierte natural ungesaettigte oils and Epoxidierungsprodukte can be used niedermolekularen serving polymers mentioned above. When phase mediators H can do besides 0.05 to 15 thread % related to the sum from A to D, a connection, which exhibits one CC double or triple bond and at least one carbonic acid -, Saeureanhydrid - in the molecule at least, acid amide -, acid imide -, carbonic acid esters -, Amino -, hydroxyl -, Epoxi -, Oxazolin -, urethane -, urea -, lactam or group of halogen benzyles, to be used. Such materials are described e.g. in the EP-A 24,120. Suitable connections are e.g. maleic acid anhydride, Maleinsaeurehydrazid, Dichlormaleinsaeureanhydrid, mark A imide, maleic acid, fumaric acid, their amides, Diamide, mono esters, Diester, until amides or until mark A imides from c1 to C20-Alkan or aryl diamines, natural fats and oils such as soy bean oil, insatiated acids, like acrylic acid or

Methacrylsaeure, their ester, amides or anhydrides, insatiated alcohols, like allyl or Crotylalkohol, Methylvinylcarbinol or Propargylalkohol, insatiated amines such as allyl or Crotylamin or adducts from the serving polymers and maleic acid anhydride. When phase mediators H come further vinylaromatische polymers, whose monomers exhibit at least partly a carbonic acid -, saeureanhydrid -, Saeureamid -, acid imide -, carbonic acid esters -, Amino -, hydroxyl -, Epoxi -, Oxazolin -, urethane -, urea -, lactam or group of halogen benzyles, in quantities from 2 to 30, in particular 2 to 15 Gew,%, related to the sum of the components A to D, the molding materials according to invention, in consideration. This polymers become by copolymerisation of vinylaromatischen monomers, as styrene?-methylstyrol or p-Methylstyrol with the copolymerisierbaren funktionalisierten monomers mentioned or by grafting receive this to monomers on vinylaromatische polymers such as polystyrene. Such compatibility mediators are well-known e.g. from the writings EP-A 46,040, EP-A 147,874, EP-A 255,184, DE-A 3,535,273 or DE-A 3,619,224. Also styrene maleic acid copolymers are suitable or with maleic acid anhydride modified, if necessary part-hydrogenated styrene butadiene block copolymers. As component H can be used further 0.05 to 15 thread % related to the sum from A to D, oxidized polyolefins in accordance with EP-A 164,767. Is likewise suitable 0.05 to 10 thread % silicon connections, which in the molecule at least one group of Si degrees and CC doubles -, C-C-Dreifachbindung or one directly at Si bound Amino or Merkapto-gruppe do not exhibit like?-Aminopropyl-triethoxy-silane or Vinyl-tris-(2-methoxyethoxy)silan. Such connections are well-known from the EP-A 182,163. Funktionalisierte or modified Polyphenylenether B2 are actually well-known, e.g. from WO-A 86/02086, WO-A 87/00540, EP-A-222 246, EP-A-223 116 and EP-A-254 048. Usually the Polyphenylenether B1 is modified lactam or group of halogen benzyles by installation at least a Carbonyl -, carbonic acid -, saeureanhydrid -, acid amide -, acid imide, Carbonsaeureester -, carboxylate -, Amino -, hydroxyl -, Epoxi -, Oxazolin -, urethane -, urea -, so that a hinreichende compatibility with the PP A is ensured. The phase mediator H becomes thus dispensable by the modification of the Polyphenylenethers B1. The modification is accomplished if necessary generally by polymere-similar conversion of a Polyphenylenethers B1 with a modifier, which contains at least one of the groups specified above, in solution (WO-A 86/2086), in aqueous dispersion, in a gaseous phase procedure (EP-A-25 200) or in the melt in presence of suitable vinylaromatischen polymers or Schlagzaehmodifiern, whereby one can along-use radical starters. Suitable modifiers are for example maleic acid, Methylmaleinsaeure, Itaconsaeure, Tetrahydrophthalsaeure, their anhydrides and imides, fumaric acid, the mono and Diester of these acids, e.g. from C1 and C2-C8-Alkanolen, the mono or diamines of these acids such as n-Phenylmaleinimid, Maleinhydrazid, the saeurechlorid of the Trimelithsaeureanhydrids, Benzol-1,2-dicarbonsaueureanhydrid-4-carbonsaeure-essigsaeureanhydrid, Chlor-ethanoylsuccinaldehyd, Chlorformylsuccinaldehyd, citric acid and Hydroxysuccinsaeure. Preferred in the molding materials according to invention as component B a modified Polyphenylenether is used, that by conversion from 50 to 99.95, in particular 71 to 92 Gew,% Polyphenylenether B1, 0 to 35, in

particular 1 to 25 Gew, % vinylaromatischen polymers, 0.05 to 10, in particular 0.3 to 3 Gew, % maleic acid or Fumarsaeuremonoester or more diester with c1 to C8-Alkanolen such as methanol or ethanol, maleic acid or fumaric acid mono amide or diamid, which can be substituted at the nitrogen if necessary with C1-C8-Alkylresten, mark A imide, maleic acid, fumaric acid or maleic acid anhydride and 0 to 5 Gew, %, in particular 0.02 to 0.08 thread % of a radical starter in runs mixing and kneading aggregates suitable from 0,5 to 15 minutes with 240 to 375°C in how two-screw-type extruding machines is available. Vinylaromatische polymers is preferentially with the Polyphenylenether B1 compatible. The molecular weight this actually well-known polymers lies generally within the range of 1500 to 2,000,000, preferably within the range of 70,000 to 1,000,000. Examples of preferential vinylaromatische polymers compatible with Polyphenylenethern are already mentioned the Monographie of Olabisi, S. to infer 224 to 230 and 245. Polymers from styrene, chlorine styrene?-Methylstyrol and p-Methylstyrol are mentioned; in subordinated portions (preferably no more as 20, in particular no more than 8 Gew, %), also Comonomere can be involved in the structure such as acrylonitrile, Methacrylnitril, acrylic acid ester or Methacrylsaeureester. Particularly preferential vinylaromatische polymers are polystyrene and impacttoughly modified polystyrene. Of course also mixtures can be used this polymers. The production preferably takes place after in the EP-A-302 485 described procedures. As radical starters are mentioned: Di(2,4-dichlorbenzoyl)peroxid, tert. Butylperoxid, Di-(3,5,5-trimethylhexanol)peroxid, Dilauroylperoxid, Didecanoylperoxid, Dipropionylperoxid, Dibenzoylperoxid, tert.-Butylperoxy-2-ethylhexoat, tert. Butylperoxydiethylacetat, tert. Butylperoxyisobutytrat, 1,1-Di-tert.-butylperoxy-3,3,5-trimethylcyclohexan, tert. Butylperoxyisopropylcarbonat, tert.-Butylperoxy-3,3,5-trimethylhexoat, tert. Butylperacetat, tert. Butylperbenzoat, 4,4-Di-tert.-butylperoxyvaleriansaeure-butylester, 2,2-Di-tert.-butylperoxybutan, Dicumylperoxid, tert. Butylcumylperoxid, 1,3-Di(tert.-butylperoxyisopropyl)benzol and Di-tert.-butylperoxid. Organic hydraulic peroxides are in addition suitable as Di-isopropylbenzolmonohydroperoxid, Cumolhydroperoxid, tert. Butylhydroperoxid, p-Menthylhydroperoxid and Pinanhydroperoxid as well as high-branched alkanes of the general structure whereby the remainders of R same or different and alkyl groups with 1 -8 C-atoms, alkoxy groups with 1 -8 C-atoms, can to be groups of aryls such as phenyl, Naphthyl or 5 or 6-gliedrige Heterocyclen with a?-Elektronensystem and a nitrogen, oxygen or sulfur as heteroatomen mean. The substituents R can contain for their part functional groups as substituents, like carboxyl -, carboxyl derivative -, hydroxyl -, Amino -, Thiol or epoxy groups. Examples are 2,3-Dimethyl-2,3-diphenylbutan, 3,4-Dimethyl-3,4-diphenylhexan and 2,2,3,3-Tetraphenylbutan. The component B1 can contain up to 40 thread % vinylaromatischen polymers in mixture. As component C the molding materials according to invention 0.1 to 15, preferably 0.1 to 10 and in particular 0.1 to 5 Gew, % thermotropen, liquidcrystalline polymers contain. When one designates thermotrope, liquidcrystalline polymers such polymers, which form so-called liquidcrystalline melts with anisotropic characteristics. One knows the liquidcrystalline character of the melts of such polymere ones by its

Scheropaleszenz, which prove optical investigation between crossed polarizers (see DE 25 20 819) or the strongly scherbhaengigen process of the fusion viscosity. When thermotrope, liquidcrystalline polymers C, which form an optically anisotropic melt above 200°C, preferably according to invention full-aromatic polyesters, polyester amides, Polyetherester, polyester imides, Polyazomethine, PP, PU, aromatic-aliphatic polyesters or aromatic-aliphatic polyester amides begun. Representative examples of full-aromatic polyesters with the suitable thermal tropics liquidcrystalline characteristics are described in the following US patent specifications: 3,991,013; 4,156,070; 4,226,970; 4,256,624; 4,412,058; 4,500,699. Further applicable according to invention full-aromatic polyesters become in the DE-OS 35 17 270; 35 17 948; 33 38 623 described. Preferred thereby the full-aromatic polyesters are used, whose polymer chains of aromatic dicarbonic acids, aromatic Diolen and/or aromatic hydroxy acids to compose itself. Generally the majority must have aromatic polymers developing monomers a stretched structure e.g. in para disubstituierten benzene derivatives, 4,4'-disubstituierten Biphenylderivaten or in Naphthalinderivaten; a part of the developing units must deviate however either from the stretched structure (e.g. in the case of metasubstituierter benzene derivatives) or with stretched structure lateral substituents to carry. Representative examples of full-aromatic polyester amides, which can be used according to invention, become in the US patent specifications 43 30 457; 43 51 917; 43 51 918 and 43 41 688 described. Representative examples of aromatic-aliphatic polyesters with thermotropen liquidcrystalline characteristics cover also copolymers from Hydroxybenzoesaeure and Polyalkylenterephthalat, like them in the US Patentschriften 38 04 805; 41 38 842 and 43 55 133 to be described. Representative examples of applicable according to invention aromatischaliphatische polyesters are described in the JP-A 5 81 76 216. The full-aromatic or aromatic-aliphatic polyesters and/or polyester amides can exhibit different functional groups at their polymer chains still, like imide -, carbonate -, urea -, ether -, Keto -, sulfide -, sulfone or Azogruppen. Furthermore they can be substituted at the aromatic units by halogen atoms or alkyl residues, in particular alkyl residues with 1 to 4 carbon atoms. Apart from the substantial components A, B and C know the molding materials according to invention 0 to 25, prefer 1 to 15 and in particular 3 to 12 thread % india rubber reading tables of a polymer containing. Usual Schlagzaehmodifier D can be used, those for PP (component A) is suitable and india rubbers D, which modify usually Polyphenylenether (component B) impacttoughly. When india rubber reading tables of polymers D for PP A become such preferentially, which exhibit reactive groups at the surface. Such groups are e.g. Epoxy -, carboxyl -, latent carboxyl -, Amino or amide groups as well as functional groups, which can be introduced by use of monomers of the general formula, whereby the substituents can have the following meaning: R¹ hydrogen or a C1-C4-Alkylgruppe, R² hydrogen, a C1-C8-Alkylgruppe or a group of aryls, in particular phenyl, R³ hydrogen, a C1-C10-Alkyl -, a C6-C12-Arylgruppe or a OR₄, where R₄ is a C1-C8- or a C6-C12-Arylgruppe, which can be substituted if necessary with o or n-haltigen groups, X a chemical connection, a C1-C10-Alkyl or C6-C12-Arylgruppe or Y where Y either O-Z- or NH-Z meant and Z

can be a C1-C10-Alkylen or a C6-C12-Arylengruppe. Also in the EP-A 208,187 described grafting monomers are suitable for the Einfuehrung of reactive groups at the surface. Examples of monomers, with which the mentioned functional groups can be introduced, are Methacrylsaeureglycidylester, Acrylsaeureglycidylester, Allylglycidylether, Vinylglycidylether, Itaconsaeureglycidylester, acrylic acid, Methacrylsaeure and their metal -, in particular alkali metal and ammonium salts, maleic acid, fumaric acid, Itaconsaeure, Vinylbenzoesaeure, Vinylphthalsaeure, mono ester of these acids with C1-C30-Alkoholen such as methyl -, ethyl -, Propyl -, Isopropyl -, n-butyl -, i-Butyl -, Hexyl -, cyclohexyl -, Octyl -, 2-Ethylhexyl -, Decyl -, Stearyl -, Methoxyethyl -, Ethoxyethyl or Hydroxyethylalkohol. Maleic acid anhydride as well as esters of the acrylic acid or Methacrylsaeure with tertiary alcohols, e.g. tert. Butylacrylat, exhibit no free groups of carboxyls, approximate in their behavior however the free acids and as monomers with latent groups of acids are therefore designated. As further examples are still acrylamide, Methacrylamid and substituierte esters of the acrylic acid or Methacrylsaeure as (n-t-Butylamino)ethylmethacrylat, (N, n-Dimethylamino)ethylacrylat, (N, n-Dimethylamino)methylacrylat and (N, n-Diethylamino)ethylacrylat mentioned. The portion of the groups derived from that managing specified monomers amounts to generally 0.5 to 40, preferably 0.5 to 25 Gew, % related to the total weight of the india rubber. This monomers can be already copolymerisiert either with the other monomers with the production of the india rubber or however on already finished an available, preferably did not modify india rubber to be grafted, under use of radical starters. With the india rubbers it concerns generally polymers, which are composed as main components preferentially of at least two the following monomers: Ethyls, propylene, butadiene, Isobuten, Isopren, Chloropren, vinyl acetate, styrene, acrylonitrile, acrylic acid, Methacrylsaeure and acryl and Methacrylsaeureester with 1 to 18 C-atoms in the Alkoholkomponente. When first preferential group are the so-called ethyl propylene (EPM) and/or ethyl propylene serve (EPDM) india rubbers to call, which preferably exhibits a relationship from ethyl to propylene units within the range of 40:60 to 90:10. The Mooney viscosities (ML1+4/100°C) such unvernetzter EPM and/or EPDM Kautschuke (gel contents generally under 1 Gew, %) lie preferentially within the range of 25 to 100, in particular from 35 to 90 (based on the large rotor after 4 minutes of running time with 100°C according to DIN 53,523). EPM india rubbers have generally practically no more double bonds, while EPDM india rubbers can exhibit 1 to 20 Doppelbindungen/100 of C-atoms. When serving monomers for EPDM india rubbers are for example conjugated serve like Isopren and butadiene, did not conjugate serve with 5 to 25 C-Atomen like Penta-1,4-dien, Hexa-1,4-dien, Hexa-1,5-dien, 2,5-Dimethylhexa-1,5-dien and Octa-1,4-dien, cyclische serve like Cyclopentadien, Cyclohexadiene, Cyclooctadiene and Dicyclopentadien as well as Alkenylnorbornene such as 5-Ethyliden-2-norbornen, 5-Butyliden-2-norbornen, 2-Methallyl-5-norbornen, 2-Isopropenyl-5-norbornen and Tricyclocodiene such as 3-Methyl-tricyclo(5.2.1.0.2.6)-3,8-decadien or their mixtures mentioned. Hexadien-1,5,5-Ethyliden-norbornen and Dicyclopentadien are preferred. The Diengehalt of the EPDM india rubbers amounts to generally 0.5 to 50, in particular 3 to 15 Gew, %,

related to the total weight of the india rubber. EPM- and/or EPDM india rubbers are usually grafted with groups and the reactive basic monomers specified above. Here are only acrylic acid, Methacrylsaeure and their derivatives as well as maleic acid anhydride mentioned. A further group of india rubbers copolymers with esters of the acryl and/or Methacrylsaeure, e.g. with methyl -, are additional ethyl -, Propyl -, n -, i and/or t-Butyl and 2-Ethylhexylestern. can the india rubbers still the reactive groups specified above e.g. in the form of dicarbonic acids, derivatives of these acids, vinylestern and ethern contain. The ethyl content that copolymers is appropriate generally within the range of 50 to 98 Gew,%, the portion of epoxy groups for containing monomers and the portion of the acrylic acid and/or Methacrylsaeureesters in each case within the range of 1 to 49 Gew.%. Olefinpolymerisate from 50 to 98.9 in particular 60 to 95 Gew,%, ethyls, 0.1 to 20, in particular 0.15 to 15 Gew,%, Glycidylacrylat and/or Glycidylmethacrylat, are preferential acrylic acid and/or maleic acid anhydride, 1 to 45, in particular 10 to 35 Gew,%, n-butyl acrylate and/or 2-Ethylhexylacrylat. The production that managing described ethyl copolymers can take place in actually well-known procedures, preferably via statistic copolymerisation under high pressure and increased temperature. Appropriate procedures are well-known. The melt-flow index that ethyl copolymers lies generally within the range of 1 to 80 g/10 min (measured with 190°C and 2.16 kg of load). Suitable elastomers for the impact tough modification of PP are further reactive groups containing grafting copolymers with butadiene, butadiene/styrene -, butadiene/acrylonitrile and acryl ester india rubbers as grafting basis, like them e.g. into the DE-A 16 94 173, DE-A 23 48 377, DE-A 24 44 584 and DE-A 27 26 256 to be described. From these the so-called ABS polymers are mentioned, as they are described into the DE-A-20 35,390, DE-A-22 48,242 and the EP-A-22 216. Such grafting polymers are preferably of 25 to 98 Gew,%, of an acrylate india rubber with a glass transition temperature of under -20°C as grafting basis (basis polymer) and 2 to 75 Gew,%, copolymerisierbaren ethylenisch insatiated monomers, whose Homo and/or copolymers exhibits a glass transition temperature of more than 25°C, as grafting edition (grafting covering) composed. The grafting basis is an acrylate or a Methacrylatkautschuk, whereby up to 40 Gew,%, further Comonomerer can be contained. The C1-C8-Ester of the acrylic acid and/or Methacrylsaeure as well as of them halogenierte derivatives like also aromatic acrylic acid esters and their mixtures is usually used. As Comonomere in the grafting basis are aforementioned acrylonitrile, Methacrylnitril, styrene?-Methylstyrol, acrylamides, Methacrylamide as well as Vinyl-C1-C6-Alkylether. The grafting basis can be unvernetzt or partly or completely vernetzt. Cross-linking is obtained e.g. by copolymerisation of vorzugsweise 0.02 to 5 Gew,%, in particular 0.05 to 2 Gew,%, interlacing monomers with more than one double bond. Suitable ones interlacing monomers become e.g. in the DE-A 27 26 256 and the EP-A 50,265 beschrieben. Preferential ones interlacing monomers are tri allyl cyanogen urate, Triallylisocyanurat, Triacryloylhexahydro s triazin and tri allyl benzene. If interlacing monomers more the than 2 polymerizable Doppelbindungen exhibit, it is favourable, their quantity on no more than 1 Gew,%, related to the grafting basis to limit. Well suitable grafting bases are emulsion

polymers with a gel content of more than 60 Gew.%, (Stuttgart determines, 1977) in dimethylformamide with 25°C according to M. Hoffmann, H. Kroemer, R. Kuhn, Polymeranalytik, George Thieme Verlag. As grafting basis acrylate india rubbers with a serving core are likewise suitable, as they are described e.g. in the EP-A 50,262. As grafting monomers are particularly suitable styrene?-Methylstyrol, Acrylnitril, Methacrylnitril and Methylmethacrylat or their mixtures, in particular such from styrene and acrylonitrile in the weight ratio from 1:1 to 9:1. The introduction of the reactive groups to grafting copolymers can take place e.g. via use appropriate monomers with the production of the grafting covering. In this case their portion of the Ppropfmonomermischung 0.5 to 30 amounts to preferably, in particular 1 to 25 Gew.%. It is also possible to apply for appropriate monomers as last grafting covering separately. The grafting yield, i.e. the quotient from the quantity for grafted monomers and the quantity assigned grafting monomers is appropriate generally within the range of 20 to 90 %. as further india rubbers are such to be called, which modifies the Polyphenylenether (component B) impacttoughly. Thermoplastic india rubbers, like polybutadiene -, are exemplary Polybuten -, polyisoprene -, acrylonitrile butadiene -, ethyl propylene -, polyester or ethyl india rubbers and elastomers of copolymers from ethyls and esters of the acrylic acid or Methacrylsaeure, e.g. Ethylenbutylacrylatcopolymere mentions. Further Ionomere, Polyoctenylene, Ppropfkautschuke with a grafting core from butadiene or Isopren or Alkylacrylaten or Alkylmethacrylaten and a grafting covering from styrene and/or?-Methylstyrol are mentioned as well as preferably styrene butadiene block copolymers einschliesslich OFF -, ABA -, and starting from starting from block copolymers, which can have transitions also smeared, star block copolymers and similar, similar Isoprenblockcopolymerisate and (teil)hydrierte block copolymers. These india rubbers can be used also in with vinylaromatischen monomers such as styrene of grafted form (EP-A 234,063 and USA 4,681,915). The india rubbers D exhibit preferably a glass transition temperature of under -30°C, in particular from under -40°C. Of course also mixtures that can be used managing specified india rubber types. The molding materials according to invention can contain 0 to 20 thread % further polymers (component E). Mentioned polyethylene, Polypropylen, styrene acrylonitrile copolymers with a acrylonitrile content is larger than 20 thread % polymethyl metacrylate, polycarbonate, Polybutylen-terephthalat, polyethylene terephthalate, polysulfone, Polyethersulfon. As a the further component the molding materials according to invention 0 to 50 can do, preferably 0 to 30 and in particular 10 to 30 thread % fiber or teilchenfoermigen filler (component F) or their mixtures enthalten. Preferential ones faserfoermige reinforcement materials (component F) are Kohlenstoffasern, potassium titanate whisker, aramide fibers and particularly prefer glass fibers. When using glass fibers these can to the better compatibility with the thermoplastic PP (component A) or the Polyphenylenether (component B) with simple ones and an adhesion mediator to be equipped. Generally the used glass fibers have a diameter within the range of 6 to 20 μm . The training of these glass fibers can take place both in the form of short glass fibers and in the form of continuous strands (Rovings). In the finished spritzgussteil the middle length of the glass fibers preferably lies

within the range of 0,08 to 0.5 mm. As teilchenfoermige fillers F are suitable amorphous silicic acid, magnesium carbonate (chalk), powdered quartz, mica, talcum powder, feldspar and in particular calcium silicates such as Wollastonit and kaolin (in particular calcined kaolins). Preferential combinations of fillers are e.g. 20 Gew,% glass fibers with 15 Gew,% Wollastonit and 15 Gew,% glass fibers with 15 Gew,% Wollastonit. The molding materials according to invention can contain further flame protection means G in a concentration from 0 to 20 Gew,%, preferentially from 0 to 12.5 Gew,%, related to the total weight of the molding material. All well-known flame protection means are possible, e.g. Polyhalogendiphenyl, Polyhalogendiphenylether, Polyhalogenphthalsaeure and their derivatives, Polyhalogenoligo and polycarbonates, whereby the appropriate bromine connections are particularly effective. Examples for this are polymers of the 2,6,2',6'-Tetrabrombisphenols A of the Tetrabromphthalsaeure, the 2,6-Dibromphenols and 2,4,6-Tribromphenols and their derivatives. Preferential flame protection means G is elementary phosphorus. Usually the elementary phosphorus with e.g. PU or other Aminoplasten can be phlegmatisiert or gecoatet. In addition concentrates are suitable by red phosphorus e.g. in a PP, elastomers or a polyolefin. Particularly preferentially further 1,2,3,4,7,8,9,10,13,13,14,14-Dodecachloro-1,4,4a,5,6,6a,7,10,10a,11,12,12a-dodecahydro-1,4:7, is 10-dimethanodibenzo(a, e)-cyclooctan and if necessary a Synergisten e.g. antimony tri oxide. Further phosphorus connections like organic phosphoric acid, Phosphinate, Phosphonate, Phosphinite, Phosphinoxide, Phosphine, phosphite or phosphates are likewise preferential. As example Triphenylphosphinoxid is mentioned. This can be used alone or in mixture with red phosphorus. Examples of preferential phosphorus connections are phosphoric acid esters or partial phosphoric acid esters with same or different Kohlenwasserstoffresten as alkyl, Cycloalkyl, aryl, alkyl-substituted aryl and aryl-substituted alkyl. Up to two groups of esters can be replaced by halogen or hydrogen or their combinations, provided that at least a further group of esters with an aromatic alcohol is present. Examples of such suitable phosphates are Phenylbisdodecylphosphat, Phenylbisneopentylphosphat, Phenylethylenhydrogenphosphat, Phenyl to (3,5,5' trimethylhexylphosphat) Ethyldiphenylphosphat, 2-Ethylhexyldi(p-tolyl)phosphat, Diphenylhydrogenphosphat, Bis-(2-ethylhexyl)phenylphosphat, Tri(nonylphenyl)phosphat, Phenylmethylhydrogenphosphat, Di(dodecyl) p tolylphosphat, Tricresylphosphat, Triphenylphosphat, Dibutylphenylphosphat and Diphenylhydrogenphosphat. The preferential Phosphate is esters also exclusively aromatic alcohols. At most preferential phosphate is Triphenylphosphat. Further the combination of Triphenylphosphat with red phosphorus is preferential. As flame protection means also such connections are suitable, which contain Phosphor nitrogen connections, like Phosphonnitrilchlorid, Phosphorsaeureesteramide, phosphoric acid ester amines, phosphoric acid amides, Phosphonsaeureamide, Phosphinsaeureamide, Tris(N Aziridinyl) phosphinoxid or Tetrakis(hydroxymethyl)phosphoniumchlorid. These inflame-restraining additives are to a large extent in the trade available. Further halogenhaltige flame protection means are Tetrabrombenzol, Hexachlorbenzol

and hexadecyl bromide benzene as well as halogenated Polystyrene and Polyphenylene ether. Also in the DE-A-19 46,924 described halogenated Phthalimide can be used. From these in particular N attained, N'-Ethylenebistetrabromophthalimide meaning. Apart from the substantial components A, B and C as well as if necessary D to G can contain the molding materials according to invention usual additives and Verarbeitungshilfsmittel. Their portion amounts to generally up to 20, preferably up to 10 thread % related to the total weight of the components A to G. Usual additives are for example stabilizers and Oxidationsinhibitoren, means against heat decomposition and decomposition by ultraviolet light, sliding and releasing from form means, coloring materials, pigments and Weichmacher. Oxidation timers and heat stabilizers, which can be added to the thermoplastic masses in accordance with the invention, are e.g. halides of metals of the group of I of the periodic system, e.g. sodium -, potassium -, lithium halides, if necessary in connection with copper (I) halides, e.g. chloride, bromide or Iodide. Further zinc fluoride and Zinkchlorid can be used. Furthermore sterically hindered phenol, Hydroquinone, substituted representatives of this group and mixtures of these Verbindungen, preferably in concentrations up to 1 Gew.%, are related to the weight of the mixture, applicable. Examples of UV stabilizers are different substituted Resorcin, salicylate, Benzotriazole and Benzophenone, which are used generally in quantities up to 2 Gew.%. Materials for the increase of the screen against electromagnetic waves, like metal flakes, powders, spray, metallized fillers and conductive polymers can be along-used. Sliding and releasing from form means, which are usually added in quantities up to 1 Gew.% of the thermoplastic mass, are stearic acid, Stearylalkohol, stearic acid alkyl ester and amides as well as esters of the Pentaerythrit with langkettigen fatty acids. Under the additives also stabilizers are, those the decomposition of the red phosphorus in presence of humidity and atmospheric oxygen verhindern. As examples connections of the cadmium, zinc, aluminum, silver, iron, copper, antimony, tin, magnesium, manganese, vanadium, boron, aluminum and titanium are mentioned. Particularly suitable connections are e.g. oxides of the metals mentioned, furthermore carbonates or Oxycarbonate, hydroxides as well as salts of organic or inorganic acids such as acetates or phosphates and/or hydraulic gene phosphates and sulfates. The thermoplastic molding materials according to invention can be manufactured in actually well-known procedures, by mixing the output components in usual mixing apparatuses such as screw-type extruding machines preferably more zweischneckenextruder, Brabender mills or Banbury mills and anschliessend extruded. After the extruding the Extrudat is cooled down and cut up. In order to receive as homogeneous a molding material as possible, an intensive mixing is necessary. In addition are necessary generally middle mixing times of 0,2 to 30 minutes at temperatures from 280 to 380°C. The merging sequence of the components can be varied, in addition, then two or if necessary three components can be before-mixed, it can all components be mixed together. If the component B2 is used, then it can be of advantage to manufacture the modified Polyphenylene ether B2 in a first zone of an extrusion and to mix in one or more following zones of extrusion with the remaining components of the erfin-

erfindungsgemaessen molding material. Such a procedure is described in the DE-A 37 02 582. Masses according to invention can be hergestellt also by a Pultrusionsvorgang, as he is described in the EP-A-56 703. The glass fiber strand is impregnated with the polymer mass and abgekuehlt and cut up afterwards. The glass fiber length is identical in this case to the granulates length and lies between 3 and 20 mm. The molding materials according to invention are well processable. From this herstellbare molded articles are characterised by a increased multi-axial tenacity, a increased thermostability and a reduced water absorption. With glass-fiber reinforced molding materials the surface quality is improved. Due to this characteristic spectrum the molded article for body parts and functional parts within the engine range of motor vehicles, producible from the erfindungsgemaessen molding materials, are particularly suitable as well as for the electrical sector. Fuellstoffhaltige and/or strengthened molded articles are used particularly as wheel screens. Examples 1 to the 8 following components were used for different mixtures: Component A A/1: PP 6, number means of the molecular weight $M_n = 18000$ A/2: PP 6.6, $M_n = 22000$ component B B1: 90 thread % Poly-(2,6-dimethyl-1,4-phenylen)ether with a reduced, specific viscosity of 0,60 dl/g (1 gew.%ig in $CHCl_3$ with 25°C) and 10 thread % polystyrene. B2: 90 thread % Poly-(2,6-dimethyl-1,4-phenylen)ether with a reduced specific viscosity of 0,60 dl/g (1 thread %ig in $CHCl_3$ with 25°C) and 8 thread % polystyrene (fusion river index MFI with 200°C/5 kg of load = 24 g/10 min), 1.95 thread % fumaric acid and 0.05 thread % 3,4-Dimethyl-3,4-diphenylhexan was melted in a two-screw-type extruding machine (ZSK 30, companies Werner & Pfleiderer) proportioned, in a first part using of kneading elements with 270°C, converted in a second part under kneading and use of kneading elements with 280°C and degassed afterwards in a degassing zone with 300°C under creation by vacuum. The middle retention time in extrusion amounted to 1.5 min. Component C C/1: A 11 I-Ruehrautoklav was fed with 1328 g Terephthalsaeure, 1437 g p-Hydroxybenzoesaeure, 308 g hydrochinon, 298 g 4,4'-Dihydroxybiphenyl, 576 g 2,7-Dihydroxynaphthalin as well as 3650 g Essigsaeureanhydrid. Under nitrogen atmosphere one agitated first 30 minutes with 130°C and increased afterwards within 4 hours the temperature on 290°C. At this temperature within one hour the pressure was reduced to 25 mbar and further-agitated then still 10 minutes. The received very viscous, thread screen end polymer melt was pressed out by a soil nozzle and granuliert after cooling in a wasserbad. A glass transformation temperature of 122°C had polymers. C/2: Fullaromatic polyesters with 73 mol % 4-Oxy-benzoyl and 27 mol % 6-Oxy-2-naphtholyl-Einheiten (Vectra®A 900 of the companies most Celanese) component D D/1: Styrene butadiene styrene three-block copolymer with a styrene content of 30 thread % (Cariflex® TR 1102 of the company Shell); D/2: Zweiblockcopolymeres from styrene and hydrogenated polyisoprene block (35 Gew,% styrene content; Kraton®G 1702 of the company Shell). D/3: Terpolymeres from 70 % ethyls, 25 % n-butyl acrylate and 5 % acrylic acid production of the shaped parts the components in accordance with table 1 were mixed on a two-screw-type extruding machine (40 mm of snail diameters) at a cylinder temperature by 280°C. The fusion strand was led and granulated by a wasserbad. The dried granulates was squirted with 300°C to

round disks (60x2 mm) and with 280°C to shoulder staffs and standard small staffs. The notched-bar impact-strength ak (Charpy) became according to DIN 53453, the Durchstossarbeit DSA according to DIN 53443, the course module EZ according to DIN 53457, the Fließfähigkeit MVI according to DIN 57735 (with 275°C and 10 kg), the Waermeformbestaendigkeit HDT according to ISO 75 A and the water absorption (with 70°C; 62 % relative humidity; after 8 days storage time) following ISO 1110 determines. The surface quality was judged visually at round disks vergleichend. The composition of the molding materials and the results are to be inferred from the tables 1 and 2. The examples the tab. it shows 1 that the additive of the component according to invention C to an improvement regarding the breakthrough work, the thermostability, which fluidity and the water absorption lead. In intensified or filled attitudes (tab. 2) the additive of the component C improves additionally the surface properties.

Claims

1. A thermoplastic molding composition containing

- A) from 5 to 95.9 % by weight of a thermoplastic polyamide (component A),
- B) from 4 to 80 % by weight of a component based on a polyphenylene ether, which may contain up to 40 % by weight of a vinyl-aromatic polymer in the mixture (component B),
- C) from 0.1 to 15 % by weight of a thermotropic, liquid-crystalline oligomer or polymer (component C),
- D) from 0 to 25 % by weight of a rubber-elastic polymer (component D) and
- E) from 0 to 20 % by weight of a further polymer (component E).

2. A thermoplastic molding composition as claimed in claim 1, additionally containing, per part by weight, up to 0.5 part by weight of a fibrous or particulate filler or a mixture thereof (component F), and up to 0.2 part by weight of a flameproofing agent (component G).

3. A thermoplastic molding composition as claimed in claim 1, containing

from 15 to 94.9 % by weight of component A

from 4 to 60 % by weight of component B

from 0.1 to 10 % by weight of component C

from 1 to 15 % by weight of component D.

4. A thermoplastic molding composition as claimed in claim 1 or 2, containing

from 5 to 93.9 % by weight of component A

from 6 to 55 % by weight of component B

from 0.1 to 5 % by weight of component C

from 0 to 25 % by weight of component D and

from 0 to 30 % by weight of component F.

5. A thermoplastic molding composition as claimed in any of claims 1 to 4, containing, as component B, a mixture of
from 70 to 99.95 % by weight of an unmodified polyphenylene ether (component B₁) and

from 0.05 to 30 % by weight of a phase-compatibility promoter (component H).

6. A thermoplastic molding composition as claimed in any of claims 1 to 4, containing, as component B, a modified polyphenylene ether (component B₂).

7. A thermoplastic molding composition as claimed in claim 6, in which the modified polyphenylene ether B₂ has been prepared by reacting

b₁) from 70 to 99.9 % by weight of a polyphenylene ether,

b₂) from 0 to 20 % by weight of a vinyl-aromatic polymer,

b₃) from 0.1 to 30 % by weight of an ethylenically unsaturated compound containing at least one epoxide, amino, carboxylic acid, carboxylic anhydride, carboxylic acid ester, carboxamide or carboximide group and

b₄) from 0 to 5 % by weight of a free-radical initiator, for from 0.2 to 15 minutes at from 240 to 375°C.

8. A thermoplastic molding composition as claimed in any of claims 1 to 7, containing, as the thermotropic, liquid-crystalline oligomer or polymer, an aromatic polyester having liquid crystallinity at from 200 to 360°C.

9. The use of a thermoplastic molding composition as claimed in any of claims 1 to 8 for producing moldings.

10. A molding obtainable from a thermoplastic molding composition as claimed in any of claims 1 to 8.